SEQUENCE LISTING

<110> Jessberger, et al.

<120> METHODS FOR IDENTIFYING, TREATING, AND INDUCING INFERTILITY USING SMC1 BETA

<130> 29636/39363A

<150> US 60/499,317
<151> 2003-08-29

<160> 13

<170> PatentIn version 3.2

<210> 1
<211> 4056
<212> DNA
<213> Mus musculus

<400> 1
ctgaggcacg gcgcgcagcc atggggcacc ttgagctgct gctcgtggag aatttcaagt 60

cgtggcgagg ccgccaggtc atcggccctt tcaagaggtt cacctgcatc attggcccca 120

acggctccgg aaaatctaat gtaatggatg cacttagttt tgtaatggga gaaaagacaa 180

ctaatttaag agtaaaaaac attcaagaac ttattcatgg agcacatact ggaaaacctg 240

tttcttcttc tgcaagtgtg acaattatat acatagagga cagtggagaa gagaaaacat 300

tcacaaggat tatccgaggg gggtgctcag aatatcattt tggggataaa cccgtgagtc 360

gttctgtgta tgtagcccag ttggaaaaca taggcataat agtcaaagca cagaactgtc 420

tagtttttca gggaactgta gagtcaatat ccatgaaaaa gcccaaagag agaacccagt 480

tttttgaaga aatcagtact tcaggagaat ttataggaga atatgaggca aagaaaaaga 540

aattacaaaa agctgaagaa gatgcacaat ttcattttaa tgtgaaaaaa aatgtagctg 600

cagaacggaa gcatgcaaaa atagagaaag aagaggcaga acattaccaa aatctccttg 660

aagaattgaa aataaacaag atacaactga tgcttttcca actatattat aatgaggaaa 720

aaatcaatgt tttaaacact gaattagagc aaatggacgg gaatttaagt gttgtaaaag 780

acactctttc tcaccatgaa aacatattta aagctaagaa aaaggattat ggaatgttaa 840

ctagacaact acagcaaaca gcaaaagaac tgaaatctgt tgaagcaatt ttaaatcaga 900

agaggcctca gtacattaag gctaaagaaa acacttctca tcatctaaaa aaattagatt 960

tgtctaagaa attgataaca gacaatgaaa aacaatgttc taagcaggaa gatggcatac 1020

gagccttagt ggcagaactg gctgatttgg atagagcatg gaaaagtttt gaaaagcaga 1080

tggaagagaa aatcttacaa aaagggcgag atattgaatt ggaaaatagc cagctggatc 1140

gttacaaact gcttaaggag caagtcagac ggaaggttgg tataatgaca caacaactgg 1200

aaaaactgca gtgggaacag aaggcagaaa aagaaagact tgcatttgaa aagaggaggc 1260

atggagacac tcagggaaat ctaaaacaga taaaagaaca aatagaagag cataaaaaac 1320
gaatagagaa gttggaggaa tatacaaaga cgtgcatgga ttgcttggaa gataaaaaac 1380
agcaagaaga ggccctgaaa aaagaaattg aaaatacgaa atcaagaatg tctgaagtta 1440
atgaagaatt gagtcttatt agaaatgaat tgcagaatgc tggaattgat aaccatgagg 1500
gaaaacgtca gcagaaaaga gcagaagttc tggaacacct taaaagactt tacccagatt 1560
ctgtgtttgg aagactgctt gatctgtgtc atcctattca taagaagtac cagctggctg 1620
tgactaagct ttttggccgg tacatggttg ccattgttgt agcctcagaa aagatagcga 1680
aagattgtat tcgatttctg aaggcagaaa gagctgaacc tgagacattc cttgctctag 1740
attaccttga tatcaagcca atcaatgaac gactaaggga aattaaaggc tgtaagatga 1800
tgatcgatgt tataaagacc cagtttcctc agctgaagaa agtgattcag tttgtttgtg 1860
gaaatggcct tgtctgtgag actgtggaag aagcaagaca tattgcattc ggtggacctg 1920
aaagacggaa ggcagtagca cttgatggaa cactgttttt gaaatctgga gtgatttctg 1980
gagggtcaag tgacttaaag cacaaagctc tgtgctggga tgagaaagag ttacacaatc 2040
taagagacaa aagaagccaa ctagtccaag agctaaagga gttaatgaag acactccgca 2100
aggaaacaga tctgaagcaa atacagactt tagtacaagg aaccaataca cgactcaaat 2160
attcacaaaa tgaactagag atgattaaaa agaagcacct tgctacattt taccgggaac 2220
aatctcagct acaaagtgaa ttactgaata ttgattctca atgtactatg ttgagtgaag 2280
gaatcaacaa acagcaacaa aaaattgaag aatttcaaga taagatagat gaggtagaag 2340
atgacatatt ccaagacttc tgtgaagaaa ttggtgtgga aaatatccgt gaatttgaga 2400
ataaacatgt taaacagcag caagaaaatg atcaaaaaag attagagttt gaaaaacaaa 2460
aaactcggct taatattcag ctcgaatata gtcgaaatca gcttaagaag aaactgaata 2520
atatcgacac attaaaaacc acaatccaga agggcaaaga agatattgat aacctaaaaa 2580
agaccgaaga agaatgtctg aaaattgttg aggaactcat ggtgaagcaa gagcaaatta 2640
aggaagtgct tgccacacag agttccaaca ttgaaaaaat tcacatacaa attgaagagg 2700
aacgcaagaa ggttttggct gttgataggg aagttggaaa attacagaag gaagttgtaa 2760
tcattcaggg ttctttggaa cagaaactgc tagagaaaca taacttgctg ctagattgca 2820
aagttcaaga cattgacata agtcttgtgc tggggtcatt ggaggacatc attgaaatgg 2880
agctaactga aacagaaagc acccaggcaa cagctgatat ctatgagaaa gaagcatcca 2940
tccaaataga ctacagccct ctaagggagg atttaaaggc tctacaatca gataaggagg 3000
tggaggccca ccttacactc cttctacagc aagtagcatc ccaagaaaac actctactga 3060
agactacagc tccaaacttg cgagcacagg agaacttaaa gactgtcaga gacaagtttc 3120
aagaatctgc agatgttttt gaggccagca gaaaggaagc cagaatatgt aggcaagagt 3180

ttgaacaggt gaaaagacgg aggtacgatg ctttcagtca atgttttgaa cacatctcag 3240

tctcaattga tcaaatctac aagaagctct gcaggaacaa cagtgcccag gcatttctta 3300

gcccagagaa ccctgaagaa ccttacttag atggaattag ctacaactgt gtggctccag 3360

gcaaacggtt catgcccatg gacaacctgt caggggaga aaagtgtgtg gctgctctgg 3420

ctcttctgtt tgctgtacac agttttcggc ctgctccatt ctttgtatta gatgaagtag 3480

atgcagccct ggacaatact aacattggca aagtctcaag ttacatcaaa gagcagagtc 3540

aggaacagtt tcagatgata atcatttccc tgaaagagga gttctactcc aaagctgatg 3600

cactgatagg cgtctaccca gagcacaatg agtgcatgtt cagccatgtg ttgactctgg 3660

acctttccaa gtatccagac accgaagacc aagaaggcag caggagccac cggaagccca 3720

gagtaccacg agtatcaatg tctccaaagt ctccccagtc tcgttagaaa tgagtatact 3780

cttgaacagc caccagctat agaagcttta ccctgaccct gtggaggtca ggccagtctc 3840

tgtttagacc catgtgtcat agaagaaaaa tctcttacca ttttagtaga aaaaaaacta 3900

tagcccactc agctaaggag tgctcagtgt cattccaatg gaggttccta tggcatcaat 3960

gaatgaggta tatggttttc ttttgctttt aagggctttt gttttgaaac aaattggtta 4020

taaaattttg aattctgcaa aaaaaaaaaa aaaaaa 4056

<210> 2
<211> 1248
<212> PRT
<213> Mus musculus

<400> 2

Met Gly His Leu Glu Leu Leu Leu Val Glu Asn Phe Lys Ser Trp Arg
1 5 10 15

Gly Arg Gln Val Ile Gly Pro Phe Lys Arg Phe Thr Cys Ile Ile Gly
20 25 30

Pro Asn Gly Ser Gly Lys Ser Asn Val Met Asp Ala Leu Ser Phe Val
35 40 45

Met Gly Glu Lys Thr Thr Asn Leu Arg Val Lys Asn Ile Gln Glu Leu
50 55 60

Ile His Gly Ala His Thr Gly Lys Pro Val Ser Ser Ser Ala Ser Val
65 70 75 80

Thr Ile Ile Tyr Ile Glu Asp Ser Gly Glu Glu Lys Thr Phe Thr Arg
85 90 95

Ile Ile Arg Gly Gly Cys Ser Glu Tyr His Phe Gly Asp Lys Pro Val

100 105 110

Ser Arg Ser Val Tyr Val Ala Gln Leu Glu Asn Ile Gly Ile Ile Val
115 120 125

Lys Ala Gln Asn Cys Leu Val Phe Gln Gly Thr Val Glu Ser Ile Ser
130 135 140

Met Lys Lys Pro Lys Glu Arg Thr Gln Phe Phe Glu Glu Ile Ser Thr
145 150 155 160

Ser Gly Glu Phe Ile Gly Glu Tyr Glu Ala Lys Lys Lys Lys Leu Gln
165 170 175

Lys Ala Glu Glu Asp Ala Gln Phe His Phe Asn Val Lys Lys Asn Val
180 185 190

Ala Ala Glu Arg Lys His Ala Lys Ile Glu Lys Glu Glu Ala Glu His
195 200 205

Tyr Gln Asn Leu Leu Glu Glu Leu Lys Ile Asn Lys Ile Gln Leu Met
210 215 220

Leu Phe Gln Leu Tyr Tyr Asn Glu Glu Lys Ile Asn Val Leu Asn Thr
225 230 235 240

Glu Leu Glu Gln Met Asp Gly Asn Leu Ser Val Val Lys Asp Thr Leu
245 250 255

Ser His His Glu Asn Ile Phe Lys Ala Lys Lys Lys Asp Tyr Gly Met
260 265 270

Leu Thr Arg Gln Leu Gln Gln Thr Ala Lys Glu Leu Lys Ser Val Glu
275 280 285

Ala Ile Leu Asn Gln Lys Arg Pro Gln Tyr Ile Lys Ala Lys Glu Asn
290 295 300

Thr Ser His His Leu Lys Lys Leu Asp Leu Ser Lys Lys Leu Ile Thr
305 310 315 320

Asp Asn Glu Lys Gln Cys Ser Lys Gln Glu Asp Gly Ile Arg Ala Leu
325 330 335

Val Ala Glu Leu Ala Asp Leu Asp Arg Ala Trp Lys Ser Phe Glu Lys
340 345 350

Gln Met Glu Glu Lys Ile Leu Gln Lys Gly Arg Asp Ile Glu Leu Glu
355 360 365

Asn Ser Gln Leu Asp Arg Tyr Lys Leu Leu Lys Glu Gln Val Arg Arg
370 375 380

Lys Val Gly Ile Met Thr Gln Gln Leu Glu Lys Leu Gln Trp Glu Gln
385 390 395 400

Lys Ala Glu Lys Glu Arg Leu Ala Phe Glu Lys Arg Arg His Gly Asp
405 410 415

Thr Gln Gly Asn Leu Lys Gln Ile Lys Glu Gln Ile Glu Glu His Lys
420 425 430

Lys Arg Ile Glu Lys Leu Glu Glu Tyr Thr Lys Thr Cys Met Asp Cys
435 440 445

Leu Glu Asp Lys Lys Gln Gln Glu Glu Ala Leu Lys Lys Glu Ile Glu
450 455 460

Asn Thr Lys Ser Arg Met Ser Glu Val Asn Glu Glu Leu Ser Leu Ile
465 470 475 480

Arg Asn Glu Leu Gln Asn Ala Gly Ile Asp Asn His Glu Gly Lys Arg
485 490 495

Gln Gln Lys Arg Ala Glu Val Leu Glu His Leu Lys Arg Leu Tyr Pro
500 505 510

Asp Ser Val Phe Gly Arg Leu Leu Asp Leu Cys His Pro Ile His Lys
515 520 525

Lys Tyr Gln Leu Ala Val Thr Lys Leu Phe Gly Arg Tyr Met Val Ala
530 535 540

Ile Val Val Ala Ser Glu Lys Ile Ala Lys Asp Cys Ile Arg Phe Leu
545 550 555 560

Lys Ala Glu Arg Ala Glu Pro Glu Thr Phe Leu Ala Leu Asp Tyr Leu
565 570 575

Asp Ile Lys Pro Ile Asn Glu Arg Leu Arg Glu Ile Lys Gly Cys Lys
580 585 590

Met Met Ile Asp Val Ile Lys Thr Gln Phe Pro Gln Leu Lys Lys Val
595 600 605

```
Ile Gln Phe Val Cys Gly Asn Gly Leu Val Cys Glu Thr Val Glu Glu
    610                 615                 620

Ala Arg His Ile Ala Phe Gly Gly Pro Glu Arg Arg Lys Ala Val Ala
625                 630                 635                 640

Leu Asp Gly Thr Leu Phe Leu Lys Ser Gly Val Ile Ser Gly Gly Ser
                645                 650                 655

Ser Asp Leu Lys His Lys Ala Leu Cys Trp Asp Glu Lys Glu Leu His
            660                 665                 670

Asn Leu Arg Asp Lys Arg Ser Gln Leu Val Gln Glu Leu Lys Glu Leu
        675                 680                 685

Met Lys Thr Leu Arg Lys Glu Thr Asp Leu Lys Gln Ile Gln Thr Leu
    690                 695                 700

Val Gln Gly Thr Asn Thr Arg Leu Lys Tyr Ser Gln Asn Glu Leu Glu
705                 710                 715                 720

Met Ile Lys Lys Lys His Leu Ala Thr Phe Tyr Arg Glu Gln Ser Gln
                725                 730                 735

Leu Gln Ser Glu Leu Leu Asn Ile Asp Ser Gln Cys Thr Met Leu Ser
            740                 745                 750

Glu Gly Ile Asn Lys Gln Gln Gln Lys Ile Glu Glu Phe Gln Asp Lys
        755                 760                 765

Ile Asp Glu Val Glu Asp Asp Ile Phe Gln Asp Phe Cys Glu Glu Ile
    770                 775                 780

Gly Val Glu Asn Ile Arg Glu Phe Glu Asn Lys His Val Lys Gln Gln
785                 790                 795                 800

Gln Glu Asn Asp Gln Lys Arg Leu Glu Phe Glu Lys Gln Lys Thr Arg
                805                 810                 815

Leu Asn Ile Gln Leu Glu Tyr Ser Arg Asn Gln Leu Lys Lys Lys Leu
            820                 825                 830

Asn Asn Ile Asp Thr Leu Lys Thr Thr Ile Gln Lys Gly Lys Glu Asp
        835                 840                 845

Ile Asp Asn Leu Lys Lys Thr Glu Glu Glu Cys Leu Lys Ile Val Glu
    850                 855                 860
```

```
Glu Leu Met Val Lys Gln Glu Gln Ile Lys Glu Val Leu Ala Thr Gln
865                 870                 875                 880

Ser Ser Asn Ile Glu Lys Ile His Ile Gln Ile Glu Glu Glu Arg Lys
                885                 890                 895

Lys Val Leu Ala Val Asp Arg Glu Val Gly Lys Leu Gln Lys Glu Val
            900                 905                 910

Val Ile Ile Gln Gly Ser Leu Glu Gln Lys Leu Leu Glu Lys His Asn
        915                 920                 925

Leu Leu Leu Asp Cys Lys Val Gln Asp Ile Asp Ile Ser Leu Val Leu
    930                 935                 940

Gly Ser Leu Glu Asp Ile Ile Glu Met Glu Leu Thr Glu Thr Glu Ser
945                 950                 955                 960

Thr Gln Ala Thr Ala Asp Ile Tyr Glu Lys Glu Ala Ser Ile Gln Ile
                965                 970                 975

Asp Tyr Ser Pro Leu Arg Glu Asp Leu Lys Ala Leu Gln Ser Asp Lys
            980                 985                 990

Glu Val Glu Ala His Leu Thr Leu  Leu Leu Gln Gln Val  Ala Ser Gln
        995                 1000                1005

Glu Asn  Thr Leu Leu Lys Thr  Thr Ala Pro Asn Leu  Arg Ala Gln
    1010                1015                1020

Glu Asn  Leu Lys Thr Val Arg  Asp Lys Phe Gln Glu  Ser Ala Asp
    1025                1030                1035

Val Phe  Glu Ala Ser Arg Lys  Glu Ala Arg Ile Cys  Arg Gln Glu
    1040                1045                1050

Phe Glu  Gln Val Lys Arg Arg  Arg Tyr Asp Ala Phe  Ser Gln Cys
    1055                1060                1065

Phe Glu  His Ile Ser Val Ser  Ile Asp Gln Ile Tyr  Lys Lys Leu
    1070                1075                1080

Cys Arg  Asn Asn Ser Ala Gln  Ala Phe Leu Ser Pro  Glu Asn Pro
    1085                1090                1095

Glu Glu  Pro Tyr Leu Asp Gly  Ile Ser Tyr Asn Cys  Val Ala Pro
    1100                1105                1110
```

Gly Lys Arg Phe Met Pro Met Asp Asn Leu Ser Gly Gly Glu Lys
1115 1120 1125

Cys Val Ala Ala Leu Ala Leu Leu Phe Ala Val His Ser Phe Arg
1130 1135 1140

Pro Ala Pro Phe Phe Val Leu Asp Glu Val Asp Ala Ala Leu Asp
1145 1150 1155

Asn Thr Asn Ile Gly Lys Val Ser Ser Tyr Ile Lys Glu Gln Ser
1160 1165 1170

Gln Glu Gln Phe Gln Met Ile Ile Ile Ser Leu Lys Glu Glu Phe
1175 1180 1185

Tyr Ser Lys Ala Asp Ala Leu Ile Gly Val Tyr Pro Glu His Asn
1190 1195 1200

Glu Cys Met Phe Ser His Val Leu Thr Leu Asp Leu Ser Lys Tyr
1205 1210 1215

Pro Asp Thr Glu Asp Gln Glu Gly Ser Arg Ser His Arg Lys Pro
1220 1225 1230

Arg Val Pro Arg Val Ser Met Ser Pro Lys Ser Pro Gln Ser Arg
1235 1240 1245

<210> 3
<211> 3839
<212> DNA
<213> Homo sapiens

<400> 3
cgctttttcc gcgggcgctt gataacgcgg gtgaggcgtg gagggcggcg ccatggccca 60

cctggagctg ctgcttgtgg aaaatttcaa gtcgtggcgg ggccgccagg tcattggccc 120

cttccggagg ttcacctgca tcatcggccc caacggctct ggaaaatcta atgtaatgga 180

tgcacttagt tttgtaatgg gagagaaaat agctaattta agagtgaaaa atattcaaga 240

actcattcat ggagcacata ttggaaaacc tatttcttct tctgcaagtg taaaaattat 300

atatgtggag gaaagtggcg aagagaaaac atttgcaagg attattttag ggggatgctc 360

agaatttcgc tttaatgata atcttgtgag tcgttctgtt tacattgcag agttggaaaa 420

gataggcata atagtcaaag cacaaaattg tttggttttt cagggaactg tagagtcaat 480

ttcagtgaag aaacccaaag aaaggaccca gttttttgag gaaatcagca cttcaggaga 540

gcttatagga gaatatgaag aaaagaaaag aaagttacaa aaagccgaag aggatgcaca 600

gtttaacttt aataagaaaa aaaatatagc ggcagagcgc agacaagcaa aattagagaa 660

ggaagaggca gaacgttacc agagtctcct tgaagaactg aaaatgaaca agatacaact 720
gcagcttttt caactatacc ataatgagaa aaagattcat ctcctgaaca ccaagttaga 780
gcatgtgaat agggatttga gtgtcaaaag agagtctttg tctcatcatg aaaacatagt 840
taaagccagg aaaaaggaac atggaatgct aactagacaa ctacaacaaa cagaaaaaga 900
attaaaatcg gttgaaaccc ttttaaatca gaagaggcct cagtacatta aagccaaaga 960
aaacacttct caccacctta agaaattaga tgtggctaag aaatcaataa aggacagcga 1020
aaaacaatgt tctaaacagg aagatgatat aaaagccctg gagacagagc tggctgattt 1080
agatgctgca tggagaagtt ttgaaaagca gattgaggaa gaaattttac ataaaaagcg 1140
agacattgaa ctggaagcca gtcagctgga tcgttataaa gaacttaagg aacaagtaag 1200
aaagaaagta gctacaatga ctcaacaact ggaaaaactg cagtgggaac agaagacaga 1260
tgaagaaaga ctggcatttg aaaagaggag gcatggagaa gttcagggaa atctaaaaca 1320
aataaaagaa caaatagaag atcataaaaa acgaatagag aagttagagg agtatacaaa 1380
gacatgcatg gattgcttga aagagaaaaa acagcaagag gaaaccctag tggatgaaat 1440
tgaaaaaaca aaatcaagaa tgtctgaatt taatgaagaa ttgaatctta ttagaagtga 1500
attgcagaat gctgggattg atacccatga gggaaaacgt cagcaaaaga gagcagaggt 1560
tctggaacac cttaaaagac tgtacccaga ttctgtgttt ggaagactat ttgacctgtg 1620
tcatcctatt cataagaaat accagctggc tgttactaag gtttttggcc ggttcatcac 1680
tgccattgtt gtagcctctg aaaaggtagc aaaagattgt attcgatttc tgaaggagga 1740
aagagctgaa cctgagacat tcctcgctct agattacctt gatatcaagc caatcaatga 1800
aagactaagg gagcttaaag gctgtaaaat ggtgattgat gtcataaaga ctcagtttcc 1860
tcagctgaag aaagtgattc agtttgtgtg tggaaatggt cttgtttgtg agactatgga 1920
agaagcaagg catattgcac tcagtggacc tgaaagacag aaaacagtag ctcttgatgg 1980
aacattattt ttaaaatctg gagtgatctc tggagggtca agtgacttaa aatacaaggc 2040
tagatgctgg gatgagaaag agttaaagaa tctaagagac agacgaagcc agaaaatcca 2100
agagctaaag ggtttaatga agacactccg caaagaaaca gatttgaaac aaatacagac 2160
cctgatacag ggaactcaaa cacgactcaa atattcacaa aatgaactag agatgattaa 2220
gaagaagcac cttgttgctt tttaccagga acaatctcag ttacaaagtg aactactaaa 2280
tattgagtct caatgtatta tgttgagtga aggaatcaag gaacgacaac gaagaattaa 2340
agaatttcaa gaaaagatag ataaggtaga agacgatatc ttccaacact tctgtgaaga 2400
aattggcgtg gaaaatattc gtgaatttga gaacaaacat gttaaacggc aacaagaaat 2460
tgatcaaaaa aggtattttt ataaaaagat gttgactcgg cttaatgttc aacttgagta 2520
tagtcgcagt caccttaaga agaaactgaa taagatcaac acattaaaag aaactatcca 2580

gaaaggtagt gaagatattg atcacctaaa gaaggctgaa gaaaactgtc tgcagacagt 2640

gaatgaactc atggcaaagc agcagcaact taaggacata cgtgtcactc agaactccag 2700

tgccgagaaa gttcaaactc aaattgaaga ggaacggaag aagtttctgg ctgttgatag 2760

ggaagtgggg aaattgcaaa aagaagttgt aagtattcaa acttctctgg aacagaaacg 2820

attagagaag cataacttgc tgcttgattg caaagtgcaa gacattgaga taatcctttt 2880

gtcggggtca ctggatgaca tcattgaagt ggagatggga actgaagcag aaagtaccca 2940

ggcaacaatt gatatctatg aaaaagaaga agcctttgaa atagactaca gctctctaaa 3000

agaggatttg aaggctctac agtctgatca agaaatcgag gcccacctta ggctcttatt 3060

gcagcaagta gcatcccagg aagatatctt actgaaaaca gcagccccaa acctacgagc 3120

actggagaac ttaaagactg tcagagacaa gtttcaagag tccacagatg cttttgaggc 3180

cagcagaaag gaagccagac tgtgtaggca agagttcgag caagtgaaaa aaaggagata 3240

cgatcttttc acccagtgtt ttgagcatgt ctcaatctca attgatcaaa tctacaagaa 3300

gctctgcaga aacaacagcg cccaagcatt tcttagccca gagaaccctg aagaacctta 3360

cttggaggga attagctata actgtgtggc cccaggcaaa cggtttatgc caatggacaa 3420

tttgtcaggg ggagaaaagt gtgtggcagc cttggctctc ctgtttgctg tgcacagttt 3480

tcgtcctgcc ccattctttg ttttagatga agtggatgca gccctagaca atactaacat 3540

aggcaaagtg tcaagttaca tcaaagagca aactcaagac cagtttcaga tgatagtcat 3600

ctccctaaaa gaagagttct attccagagc cgacgcgctg atcggcatct atcctgagta 3660

cgatgactgc atgttcagcc gagttttgac cctagatctt tctcagtatc cagacactga 3720

aggccaagaa agcagcaaga gacacggaga gtcccgctag gggcagtcct gcagcagtca 3780

cctgatcact gttcagttcc cactctaata ctcacacagc tcctccacag gagacttct 3839

<210> 4
<211> 1235
<212> PRT
<213> Homo sapiens

<400> 4

Met Ala His Leu Glu Leu Leu Leu Val Glu Asn Phe Lys Ser Trp Arg
1 5 10 15

Gly Arg Gln Val Ile Gly Pro Phe Arg Arg Phe Thr Cys Ile Ile Gly
20 25 30

Pro Asn Gly Ser Gly Lys Ser Asn Val Met Asp Ala Leu Ser Phe Val
35 40 45

Met Gly Glu Lys Ile Ala Asn Leu Arg Val Lys Asn Ile Gln Glu Leu

50 55 60

Ile His Gly Ala His Ile Gly Lys Pro Ile Ser Ser Ser Ala Ser Val
65 70 75 80

Lys Ile Ile Tyr Val Glu Glu Ser Gly Glu Glu Lys Thr Phe Ala Arg
85 90 95

Ile Ile Leu Gly Gly Cys Ser Glu Phe Arg Phe Asn Asp Asn Leu Val
100 105 110

Ser Arg Ser Val Tyr Ile Ala Glu Leu Glu Lys Ile Gly Ile Ile Val
115 120 125

Lys Ala Gln Asn Cys Leu Val Phe Gln Gly Thr Val Glu Ser Ile Ser
130 135 140

Val Lys Lys Pro Lys Glu Arg Thr Gln Phe Phe Glu Glu Ile Ser Thr
145 150 155 160

Ser Gly Glu Leu Ile Gly Glu Tyr Glu Glu Lys Lys Arg Lys Leu Gln
165 170 175

Lys Ala Glu Glu Asp Ala Gln Phe Asn Phe Asn Lys Lys Lys Asn Ile
180 185 190

Ala Ala Glu Arg Arg Gln Ala Lys Leu Glu Lys Glu Glu Ala Glu Arg
195 200 205

Tyr Gln Ser Leu Leu Glu Glu Leu Lys Met Asn Lys Ile Gln Leu Gln
210 215 220

Leu Phe Gln Leu Tyr His Asn Glu Lys Lys Ile His Leu Leu Asn Thr
225 230 235 240

Lys Leu Glu His Val Asn Arg Asp Leu Ser Val Lys Arg Glu Ser Leu
245 250 255

Ser His His Glu Asn Ile Val Lys Ala Arg Lys Lys Glu His Gly Met
260 265 270

Leu Thr Arg Gln Leu Gln Gln Thr Glu Lys Glu Leu Lys Ser Val Glu
275 280 285

Thr Leu Leu Asn Gln Lys Arg Pro Gln Tyr Ile Lys Ala Lys Glu Asn
290 295 300

```
Thr Ser His His Leu Lys Lys Leu Asp Val Ala Lys Lys Ser Ile Lys
305                 310                 315                 320

Asp Ser Glu Lys Gln Cys Ser Lys Gln Glu Asp Asp Ile Lys Ala Leu
                325                 330                 335

Glu Thr Glu Leu Ala Asp Leu Asp Ala Ala Trp Arg Ser Phe Glu Lys
            340                 345                 350

Gln Ile Glu Glu Glu Ile Leu His Lys Lys Arg Asp Ile Glu Leu Glu
        355                 360                 365

Ala Ser Gln Leu Asp Arg Tyr Lys Glu Leu Lys Glu Gln Val Arg Lys
    370                 375                 380

Lys Val Ala Thr Met Thr Gln Gln Leu Glu Lys Leu Gln Trp Glu Gln
385                 390                 395                 400

Lys Thr Asp Glu Glu Arg Leu Ala Phe Glu Lys Arg Arg His Gly Glu
                405                 410                 415

Val Gln Gly Asn Leu Lys Gln Ile Lys Glu Gln Ile Glu Asp His Lys
            420                 425                 430

Lys Arg Ile Glu Lys Leu Glu Glu Tyr Thr Lys Thr Cys Met Asp Cys
        435                 440                 445

Leu Lys Glu Lys Lys Gln Gln Glu Glu Thr Leu Val Asp Glu Ile Glu
    450                 455                 460

Lys Thr Lys Ser Arg Met Ser Glu Phe Asn Glu Glu Leu Asn Leu Ile
465                 470                 475                 480

Arg Ser Glu Leu Gln Asn Ala Gly Ile Asp Thr His Glu Gly Lys Arg
                485                 490                 495

Gln Gln Lys Arg Ala Glu Val Leu Glu His Leu Lys Arg Leu Tyr Pro
            500                 505                 510

Asp Ser Val Phe Gly Arg Leu Phe Asp Leu Cys His Pro Ile His Lys
        515                 520                 525

Lys Tyr Gln Leu Ala Val Thr Lys Val Phe Gly Arg Phe Ile Thr Ala
    530                 535                 540

Ile Val Val Ala Ser Glu Lys Val Ala Lys Asp Cys Ile Arg Phe Leu
545                 550                 555                 560
```

```
Lys Glu Glu Arg Ala Glu Pro Glu Thr Phe Leu Ala Leu Asp Tyr Leu
                565                 570                 575

Asp Ile Lys Pro Ile Asn Glu Arg Leu Arg Glu Leu Lys Gly Cys Lys
            580                 585                 590

Met Val Ile Asp Val Ile Lys Thr Gln Phe Pro Gln Leu Lys Lys Val
        595                 600                 605

Ile Gln Phe Val Cys Gly Asn Gly Leu Val Cys Glu Thr Met Glu Glu
    610                 615                 620

Ala Arg His Ile Ala Leu Ser Gly Pro Glu Arg Gln Lys Thr Val Ala
625                 630                 635                 640

Leu Asp Gly Thr Leu Phe Leu Lys Ser Gly Val Ile Ser Gly Gly Ser
                645                 650                 655

Ser Asp Leu Lys Tyr Lys Ala Arg Cys Trp Asp Glu Lys Glu Leu Lys
            660                 665                 670

Asn Leu Arg Asp Arg Arg Ser Gln Lys Ile Gln Glu Leu Lys Gly Leu
        675                 680                 685

Met Lys Thr Leu Arg Lys Glu Thr Asp Leu Lys Gln Ile Gln Thr Leu
    690                 695                 700

Ile Gln Gly Thr Gln Thr Arg Leu Lys Tyr Ser Gln Asn Glu Leu Glu
705                 710                 715                 720

Met Ile Lys Lys Lys His Leu Val Ala Phe Tyr Gln Glu Gln Ser Gln
                725                 730                 735

Leu Gln Ser Glu Leu Leu Asn Ile Glu Ser Gln Cys Ile Met Leu Ser
            740                 745                 750

Glu Gly Ile Lys Glu Arg Gln Arg Arg Ile Lys Glu Phe Gln Glu Lys
        755                 760                 765

Ile Asp Lys Val Glu Asp Asp Ile Phe Gln His Phe Cys Glu Glu Ile
    770                 775                 780

Gly Val Glu Asn Ile Arg Glu Phe Glu Asn Lys His Val Lys Arg Gln
785                 790                 795                 800

Gln Glu Ile Asp Gln Lys Arg Tyr Phe Tyr Lys Lys Met Leu Thr Arg
                805                 810                 815
```

Leu Asn Val Gln Leu Glu Tyr Ser Arg Ser His Leu Lys Lys Lys Leu
820 825 830

Asn Lys Ile Asn Thr Leu Lys Glu Thr Ile Gln Lys Gly Ser Glu Asp
835 840 845

Ile Asp His Leu Lys Lys Ala Glu Glu Asn Cys Leu Gln Thr Val Asn
850 855 860

Glu Leu Met Ala Lys Gln Gln Gln Leu Lys Asp Ile Arg Val Thr Gln
865 870 875 880

Asn Ser Ser Ala Glu Lys Val Gln Thr Gln Ile Glu Glu Glu Arg Lys
885 890 895

Lys Phe Leu Ala Val Asp Arg Glu Val Gly Lys Leu Gln Lys Glu Val
900 905 910

Val Ser Ile Gln Thr Ser Leu Glu Gln Lys Arg Leu Glu Lys His Asn
915 920 925

Leu Leu Leu Asp Cys Lys Val Gln Asp Ile Glu Ile Ile Leu Leu Ser
930 935 940

Gly Ser Leu Asp Asp Ile Ile Glu Val Glu Met Gly Thr Glu Ala Glu
945 950 955 960

Ser Thr Gln Ala Thr Ile Asp Ile Tyr Glu Lys Glu Glu Ala Phe Glu
965 970 975

Ile Asp Tyr Ser Ser Leu Lys Glu Asp Leu Lys Ala Leu Gln Ser Asp
980 985 990

Gln Glu Ile Glu Ala His Leu Arg Leu Leu Leu Gln Gln Val Ala Ser
995 1000 1005

Gln Glu Asp Ile Leu Leu Lys Thr Ala Ala Pro Asn Leu Arg Ala
1010 1015 1020

Leu Glu Asn Leu Lys Thr Val Arg Asp Lys Phe Gln Glu Ser Thr
1025 1030 1035

Asp Ala Phe Glu Ala Ser Arg Lys Glu Ala Arg Leu Cys Arg Gln
1040 1045 1050

Glu Phe Glu Gln Val Lys Lys Arg Arg Tyr Asp Leu Phe Thr Gln
1055 1060 1065

Cys Phe Glu His Val Ser Ile Ser Ile Asp Gln Ile Tyr Lys Lys
1070 1075 1080

Leu Cys Arg Asn Asn Ser Ala Gln Ala Phe Leu Ser Pro Glu Asn
1085 1090 1095

Pro Glu Glu Pro Tyr Leu Glu Gly Ile Ser Tyr Asn Cys Val Ala
1100 1105 1110

Pro Gly Lys Arg Phe Met Pro Met Asp Asn Leu Ser Gly Gly Glu
1115 1120 1125

Lys Cys Val Ala Ala Leu Ala Leu Leu Phe Ala Val His Ser Phe
1130 1135 1140

Arg Pro Ala Pro Phe Phe Val Leu Asp Glu Val Asp Ala Ala Leu
1145 1150 1155

Asp Asn Thr Asn Ile Gly Lys Val Ser Ser Tyr Ile Lys Glu Gln
1160 1165 1170

Thr Gln Asp Gln Phe Gln Met Ile Val Ile Ser Leu Lys Glu Glu
1175 1180 1185

Phe Tyr Ser Arg Ala Asp Ala Leu Ile Gly Ile Tyr Pro Glu Tyr
1190 1195 1200

Asp Asp Cys Met Phe Ser Arg Val Leu Thr Leu Asp Leu Ser Gln
1205 1210 1215

Tyr Pro Asp Thr Glu Gly Gln Glu Ser Ser Lys Arg His Gly Glu
1220 1225 1230

Ser Arg
1235

<210> 5
<211> 1406
<212> DNA
<213> Homo sapiens

<400> 5
cctctgcggc gtcactggga gcccgacgga aaactgcgct aaaggcttgt ctttcccctg 60

cccgaccgaa ggagccgacc ttgcctgcgc tacagcttcc ttattttcgt cgcctgttct 120

cctgatcctg cgtgttctaa aaacccctta ggctttccat gggttcccag accatggcgg 180

tggcgctgcc cagggacttg cggcaggacg ccaacctggc aaagaggagg cacgcggagc 240

tgtgcaggca gaagcgggtc ttcaacgcca gaaacaggat aattggggga gacactgaag 300

cctgggatgt tcaagttcat gaccagaaga taaaagaagc tactgaaaaa gctagacatg 360

aaacctttgc tgctgaaatg aggcaaaatg acaaaatcat gtgcatattg gaaaaccgga 420

aaaagaggga taggaaaaat ctctgtaggg ctatcaatga cttccaacag agctttcaga 480

agccagaaac tcgccgtgaa tttgatctgt ccgacccccc agcccttaag aaagatcttc 540

cagcccggca gtcagataat gatgttcgga atacgatatc aggaatgcag aaattcatgg 600

gagaggattt aaacttccat gagaggaaga aattccaaga ggaacaaaac agagaatggt 660

ctttgcagca gcaaagggaa tggaagaacg cccgtgctga acaaaaatgc gcagaggccc 720

tctacacaga gacaaggctg cagtttgacg agacagccaa gcacctccag aagctggaaa 780

gcaccaccag aaaggcagtt tgtgcatctg tgaaagactt caacaagagc caggccatcg 840

agtcagtgga aaggaaaaag caagagaaaa agcaagaaca agaggacaac ttggccgaga 900

tcaccaacct cctgcgtggg gacctgctct ccgagaaccc gcagcaggca gccagctcct 960

tcgggcccca ccgcgtggtc cctgaccgct ggaagggcat gacccaggag cagctggagc 1020

agatccgcct agtccagaag cagcaaatcc aggagaagct gaggctccag gaagaaaagc 1080

gccagcgaga cctggactgg gaccggcgga ggattcaggg ggctcgcgcc accctgctgt 1140

ttgagcggca gcagtggcgg cggcagcgcg acctgcgcag agctctggac agcagcaacc 1200

tcagcctggc caaggagcag catttgcaga aaaaatatat gaatgaagtc tatacaaatc 1260

aacccacggg agactatttc acacaattta atacaggaag tcgataatga ggaacacacc 1320

cttgttcccg tcattcacgt ataaagagtg gctaccttaa aaaaaaaaaa aaaaaaaaaa 1380

aaaaaaaaaa aaaaaaaaaa aaaaaa 1406

<210> 6
<211> 309
<212> PRT
<213> Homo sapiens

<400> 6

Met Arg Gln Asn Asp Lys Ile Met Cys Ile Leu Glu Asn Arg Lys Lys
1 5 10 15

Arg Asp Arg Lys Asn Leu Cys Arg Ala Ile Asn Asp Phe Gln Gln Ser
20 25 30

Phe Gln Lys Pro Glu Thr Arg Arg Glu Phe Asp Leu Ser Asp Pro Leu
35 40 45

Ala Leu Lys Lys Asp Leu Pro Ala Arg Gln Ser Asp Asn Asp Val Arg
50 55 60

Asn Thr Ile Ser Gly Met Gln Lys Phe Met Gly Glu Asp Leu Asn Phe

65 70 75 80

His Glu Arg Lys Lys Phe Gln Glu Glu Gln Asn Arg Glu Trp Ser Leu
85 90 95

Gln Gln Gln Arg Glu Trp Lys Asn Ala Arg Ala Glu Gln Lys Cys Ala
100 105 110

Glu Ala Leu Tyr Thr Glu Thr Arg Leu Gln Phe Asp Glu Thr Ala Lys
115 120 125

His Leu Gln Lys Leu Glu Ser Thr Thr Arg Lys Ala Val Cys Ala Ser
130 135 140

Val Lys Asp Phe Asn Lys Ser Gln Ala Ile Glu Ser Val Glu Arg Lys
145 150 155 160

Lys Gln Glu Lys Lys Gln Glu Gln Glu Asp Asn Leu Ala Glu Ile Thr
165 170 175

Asn Leu Leu Arg Gly Asp Leu Leu Ser Glu Asn Pro Gln Gln Ala Ala
180 185 190

Ser Ser Phe Gly Pro His Arg Val Val Pro Asp Arg Trp Lys Gly Met
195 200 205

Thr Gln Glu Gln Leu Glu Gln Ile Arg Leu Val Gln Lys Gln Gln Ile
210 215 220

Gln Glu Lys Leu Arg Leu Gln Glu Glu Lys Arg Gln Arg Asp Leu Asp
225 230 235 240

Trp Asp Arg Arg Arg Ile Gln Gly Ala Arg Ala Thr Leu Leu Phe Glu
245 250 255

Arg Gln Gln Trp Arg Arg Gln Arg Asp Leu Arg Arg Ala Leu Asp Ser
260 265 270

Ser Asn Leu Ser Leu Ala Lys Glu Gln His Leu Gln Lys Lys Tyr Met
275 280 285

Asn Glu Val Tyr Thr Asn Gln Pro Thr Gly Asp Tyr Phe Thr Gln Phe
290 295 300

Asn Thr Gly Ser Arg
305

<210> 7
<211> 1654
<212> DNA
<213> Mus musculus

<400> 7
taattggatc cctgctccgc cgcggaaagc ggaccgccgg gacagacttg ctctcaaact 60
tttgtgggcg ctgcttctcg gcgctgtagc tttgcttatt tctgtgggct tttcttgccg 120
tgttttttt ttccggatag ctcctgaagc ccagccgagt cccagagcca tggaggtagc 180
gatgtctaag gacctacaac aggaggccaa cctagccaag aagcggtaca ttgacctgtg 240
caggcaggga cggatcttcg acgccaggaa caggatcatt gggggagaca cacaagcctg 300
ggattttcaa gtccgtgacc agaagataaa agaaataact gacaaagcta ggcatgaagc 360
ctttgctgct gaaatgaagc acaatgacaa agtcatgtgc atggcgcatg accgggaaca 420
gaggcacagg aaacagctgt gtagagctat caatgacttc cagcagaact ttcagaagcc 480
agaaactcga cgtgagtttg atctttctga ccccctggcc ctccagaaag agcttccagc 540
ccgcatttca gacaatgaca tgcggaacac catatcagga atgcagaagt tcatgggaga 600
ggatttaaac ttccaagaga ggaggaggtt ccaaaaggaa cagagcagag aatggtttct 660
gcagcagcat ggggaacggg agaaagcccg ggctgaccac ctactggcag aacacctcca 720
cactcagacg agactcaagt ttgatgaaac agccagagag ttgatgaagc tggaaggctc 780
caccaggaag gaagtctgcg cagccgtgaa agcgttcaac aagaatcagg ttgtggagtt 840
gacagaaaga aagaggcaag agaagcaaca agaacaagaa gacaacatga ccgagatcac 900
caacctgctg catggagacc tgctttctga gaaccctcga ccggtggcca gctcctttgg 960
gtctcaccgt gtggtccttg accgctggaa gggcatgaac cgagagcagc tggaggagat 1020
ctggttcacg cagaagcggc aaatccagga gaagctgagg cttcaggagg aagagcgcca 1080
gcacagcatg gactgggatt tgcgcaggat ccggaaggct catgccagcc tgctgcatga 1140
gcggcagcag cagcgcttgc ttcgggagca gcgcagggcc ctggactgca gcaacctcaa 1200
cctggccagg cagcagtact tacagaaaaa acaaatgaat acagcctcct caagtcagcc 1260
cacagaagac tatttctcac agtttaatac aaggagccgc tgagagaacc gactgctttc 1320
cttgtttata gtagttcctc taggagtcac gcttatttca aagtgaatct gctccttggt 1380
ctgaacaccc cgtatgggca tgtgcacatg cggtcaggct ctgctctggg aagagctcta 1440
acatggcttt gggtgctgtg gacataggac acagtgaacc attccagaga ggctacactg 1500
aggcctgtgt gctgctcaag ctccaagctg gctgctcagc cattctctga ctcagtgact 1560
gaccatcata ggtgttgctt cgtgtgcccc atgaagcact tcttcctcag cttctcaccc 1620
accataaaga ggcaccaacc tgcttaccac tccc 1654

<210> 8
<211> 309
<212> PRT
<213> Mus musculus

<400> 8

Met Lys His Asn Asp Lys Val Met Cys Met Ala His Asp Arg Glu Gln
1 5 10 15

Arg His Arg Lys Gln Leu Cys Arg Ala Ile Asn Asp Phe Gln Gln Asn
20 25 30

Phe Gln Lys Pro Glu Thr Arg Arg Glu Phe Asp Leu Ser Asp Pro Leu
35 40 45

Ala Leu Gln Lys Glu Leu Pro Ala Arg Ile Ser Asp Asn Asp Met Arg
50 55 60

Asn Thr Ile Ser Gly Met Gln Lys Phe Met Gly Glu Asp Leu Asn Phe
65 70 75 80

Gln Glu Arg Arg Arg Phe Gln Lys Glu Gln Ser Arg Glu Trp Phe Leu
85 90 95

Gln Gln His Gly Glu Arg Glu Lys Ala Arg Ala Asp His Leu Leu Ala
100 105 110

Glu His Leu His Thr Gln Thr Arg Leu Lys Phe Asp Glu Thr Ala Arg
115 120 125

Glu Leu Met Lys Leu Glu Gly Ser Thr Arg Lys Glu Val Cys Ala Ala
130 135 140

Val Lys Ala Phe Asn Lys Asn Gln Val Val Glu Leu Thr Glu Arg Lys
145 150 155 160

Arg Gln Glu Lys Gln Gln Glu Gln Glu Asp Asn Met Thr Glu Ile Thr
165 170 175

Asn Leu Leu His Gly Asp Leu Leu Ser Glu Asn Pro Arg Pro Val Ala
180 185 190

Ser Ser Phe Gly Ser His Arg Val Val Leu Asp Arg Trp Lys Gly Met
195 200 205

Asn Arg Glu Gln Leu Glu Glu Ile Trp Phe Thr Gln Lys Arg Gln Ile
210 215 220

```
Gln Glu Lys Leu Arg Leu Gln Glu Glu Glu Arg Gln His Ser Met Asp
225                 230                 235                 240

Trp Asp Leu Arg Arg Ile Arg Lys Ala His Ala Ser Leu Leu His Glu
                245                 250                 255

Arg Gln Gln Gln Arg Leu Leu Arg Glu Gln Arg Arg Ala Leu Asp Cys
            260                 265                 270

Ser Asn Leu Asn Leu Ala Arg Gln Gln Tyr Leu Gln Lys Lys Gln Met
        275                 280                 285

Asn Thr Ala Ser Ser Ser Gln Pro Thr Glu Asp Tyr Phe Ser Gln Phe
    290                 295                 300

Asn Thr Arg Ser Arg
305
```

<210> 9
<211> 336
<212> DNA
<213> Mus musculus

<220>
<221> misc_feature
<222> (108)..(108)
<223> n is a, c, g, or t

<220>
<221> misc_feature
<222> (159)..(159)
<223> n is a, c, g, or t

<220>
<221> misc_feature
<222> (178)..(178)
<223> n is a, c, g, or t

<220>
<221> misc_feature
<222> (295)..(295)
<223> n is a, c, g, or t

<220>
<221> misc_feature
<222> (333)..(333)
<223> n is a, c, g, or t

<400> 9
gacattgtga tgtcacagtc tccatcctcc ctggctgtgt cagcaggaga gaaggtcact 60

atgagctgca aatccagtca gagtctgctc aacagtagaa cccgaaanaa ctacttgtct 120

tggtaccagc agaaaccagg tcagtctcct aaactgctna tctactgggc atccactngg 180

gaatctgggg tccctgatcg cttcacaggc agtggatctg ggacagattt cactctcacc 240

atcagcagtg tgcagactga agacctggca gtttattact gcaagcaatc ttatnatctc 300

ttcacgttcg gctcggggac aaagttggaa atnaaa 336

<210> 10
<211> 29
<212> DNA
<213> Artificial sequence

<220>
<223> Synthetic primer

<400> 10
ttttattaat cacggcaaga aaagcccac 29

<210> 11
<211> 25
<212> DNA
<213> Artificial sequence

<220>
<223> Synthetic primer

<400> 11
ttttaccggt gcctcagccg cttcc 25

<210> 12
<211> 278
<212> DNA
<213> Mus musculus

<400> 12
agaaaagccc acagaaataa gcaaagctac agcgccgaga agcagcgccc acaaaagttt 60

gagagcaagt ctgtcccggc ggtccgcttt ccgcagcgga gcagggatcc aattccccgg 120

gcaacgccaa cctccgttgt aagcaacggc gcctcgctcg ctctccttcc cccgcgccag 180

tctcgcgaga cttcgaaaag aatttcttcc cgcgcttttt ttttttttt tcctcacggg 240

agcacgagga agcggctgag gcacggcgcg cagccatg 278

<210> 13
<211> 267
<212> DNA
<213> Homo sapiens

<400> 13
agaacaggcg acgaaaataa ggaagctgta gcgcaggcaa ggtcggctcc ttcggtcggg 60

caggggaaag acaagccttt agcgcagttt tccgtcgggc tcccagtgac gccgcagagg 120

tacagacgct cccgctctct cggaaatgtc aacaactcgt tgctaaggaa cggctccgcg 180

cttgccgcgt ctcgctctct tctcgcgaca cttggcgaat cccttcccgc gctttttccg 240

cgggcgcttg ataacgcggg tgaggcg 267